CLAIMS

What is claimed is:

1. A method for making an electrode by depositing nano-particles on an object, comprising:

   a. forming a nano-particle dispersion comprising;

      i. providing between 0.05 wt% and 10 wt% of a charged soluble polymer having a molecular weight of less than 25,000 amu;

      ii. providing between 0.5 wt% and 10 wt% of a metal component;

      iii. providing between 99.45 % and 80 % of a carrier; and

      iv. mixing the charged soluble polymer, metal component and a carrier;

   b. coating an object with the nano-particle dispersion thereby disposing nano-particles from the nano-particle dispersion on the object to form an electric conductor;

   c. removing at least a portion of the carrier from the object;

   d. forming an electrical circuit using the electric conductor such that electric current flows in at least a portion of a medium using the electric conductor; and

   e. connecting the electrical circuit to a load.

2. The method of claim 1, further comprising the removal of at least a portion of the polymer from the object.

3. The method of claim 2, wherein the at least portion of the polymer is removed by a method selected from the group consisting of washing, burning, ablating, pyrolyzing and combinations thereof.

4. The method of claim 1, wherein the carrier is removed by a member selected from the group consisting of evaporation, freezing, critical drying and combinations thereof.

5. The method of claim 1, wherein the nano-particles are crystalline.

6. The method of claim 1, wherein the object is selected from the group consisting of a material containing a micro-structure, a porous material with micro pores, a material into which a micro-structure pattern has been formed, and combinations thereof.

7. The method of claim 1, further comprising forming features on the object, wherein the features have an average width from about 50 nanometers to about 100 microns.

8. The method of claim 1, wherein the object is electrically conductive.

9. The method of claim 1, wherein the object comprises features having an average width from about 50 nanometers to about 100 microns.

10. The method of claim 1, wherein the polymer comprises a member of the group consisting of a polyacrylate, a polymethacrylate, a monomer of acrylates, a sodium acrylate, a potassium acrylate, and combinations thereof.

11. The method of claim 1, wherein the metal component is selected from the group consisting of a noble metal, a transition metal, alloys of noble metals, alloys of transition metals and combinations thereof.

12. The method of claim 1, wherein the carrier is selected from the group consisting of water, low surface tension organic liquids miscible with water and combinations thereof.

13. The method of claim 1, wherein the dispersion comprises a nano-particle having an average diameter of between 1 nm and 50 nm.

14. The method of claim 1, wherein the electric conductor is adapted to conduct current between 0 amps per square centimeter and 100 amps per square centimeter.

15. The method of claim 7, wherein the features comprise pores, capillaries, channels, voids, ridges, fins, embossments, and combinations thereof.

16. The method of claim 15, wherein each of the features have equivalent diameters from about 25 nanometers to about 10 microns.

17. The method of claim 15, wherein each of the features comprise an aspect ratio of 1 or more and an overall width from about 5 nanometers to about 200 microns.

18. The method of claim 1, wherein the object is selected from the group consisting of a foam, a monolith of porous material, an aero gel, a mat, a felt paper, mesh, laminates thereof, composites thereof, and combinations thereof.

19. The method of claim 7, wherein the features are created using a method selected from the group consisting of etching, cutting, molding, laser treatment, electro-discharge machining, water jet cutting, microinjection molding, packed particle sintering, extruding, deep reactive ion etching, LIGA processing and combinations thereof.

20. An electrode made by the method of claim 1.

21. The electrode of claim 20, wherein the electrode is utilized in a fuel cell.